

Reconstruction of the past failure times for the proportional reversed hazard rate model

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Abstract

The problem of reconstruction of the past failure times in the left censored setup is considered. Various reconstructors of times to failure of units censored in a left-censored sample from the proportional reversed hazard rate models are demonstrated. The maximum likelihood, best unbiased and conditional median reconstructors are obtained. We also present two methods non-Bayesian and Bayesian for obtaining reconstruction intervals for the past failure times. Numerical example and a Monte Carlo simulation study are given to illustrate all the reconstruction methods discussed in this paper.

Keywords: Left censoring, Maximum likelihood reconstructor, Best unbiased reconstructor, Conditional median reconstructor, Reconstruction interval, Highest conditional density.

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1 Introduction

Let us consider the continuous random variable X with cumulative distribution function (cdf)

$$F(x; \theta) = [F_0(x)]^\theta, \quad x \in B, \quad \theta > 0, \quad (1.1)$$

where $F_0(\cdot)$ is a baseline cdf and B is the support of $F_0(\cdot)$, which is independent of the shape parameter θ . It may be noted that the family of distributions given in (1.1) include several life distributions such as power function distribution, generalized exponential distribution, Type I generalized logistic distribution, power normal distribution and so on. This model has been called in the literature as Lehman alternatives. Lehman (1953) has studied such alternatives to define various non-parametric hypotheses and has computed approximate power of certain rank test using large sample theory. The model given in (1.1) is also well known in the lifetime literature as

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